



# Residential Solar Energy

Kevin Koch

Technicians For Sustainability

[www.tfssolar.com](http://www.tfssolar.com)

# Tucson Energy Use and Impacts

Coal: 3,630,000 tons/year (more than a trainload per day)

CO<sub>2</sub>: 7,986,000 tons/year

Water: 3,126,430 gallons/day MIN (40%)



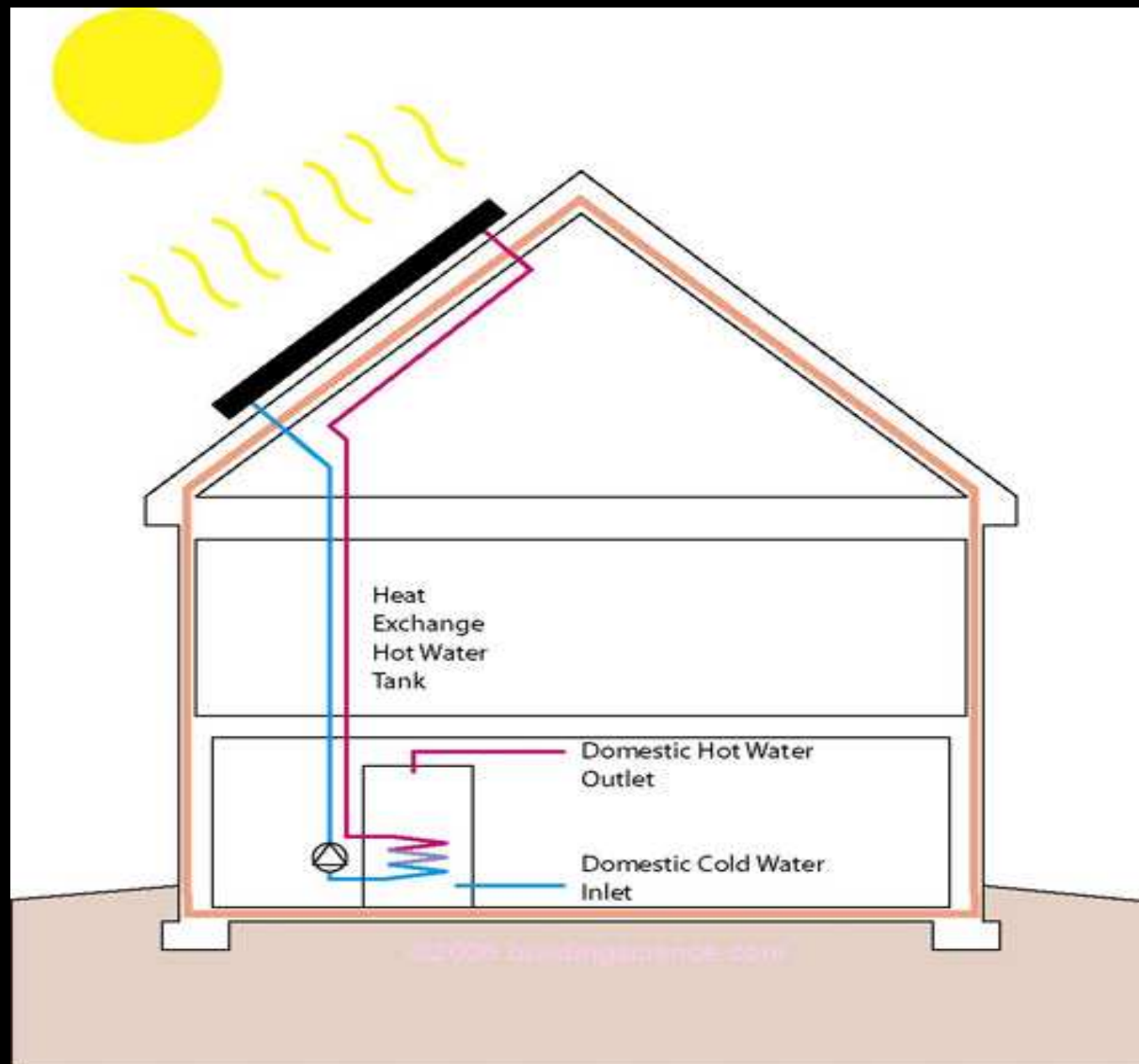
The Average Household uses approx 900 KWH/month

## Monthly

- \* 900 lbs of coal
- \* 2000 lbs of CO<sub>2</sub>
- \* 450 gal of water

4X more energy  
used than in 1990

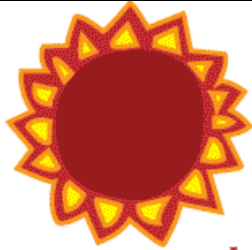
# Solar Hot Water



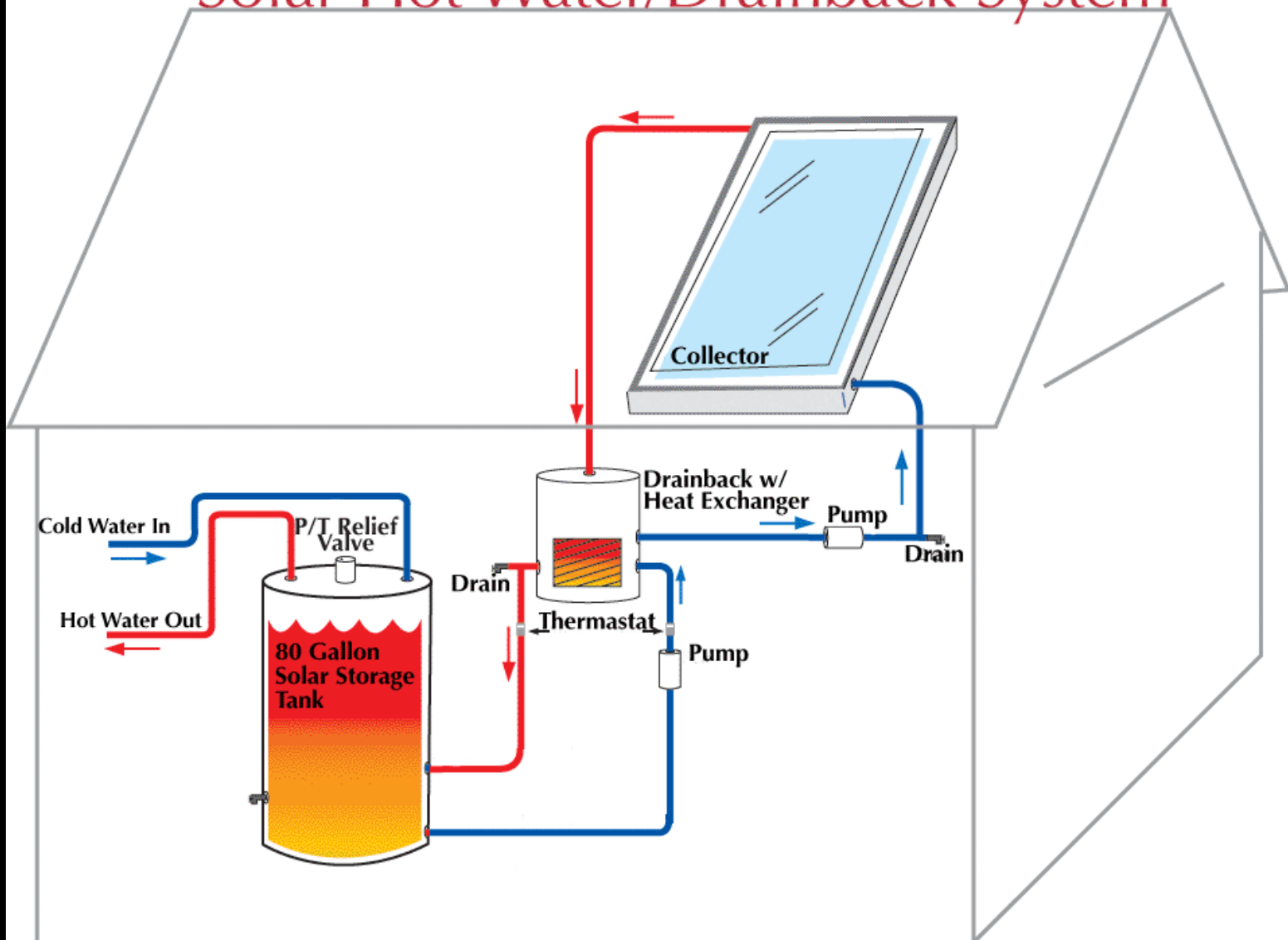
# Solar Hot Water

## Overview:

- Use it or lose it technology
- More people = More savings
- Electric ---> More savings than gas
- Freezing & overheating
- Electric tank back-up
- 50 – 90% of hot water use can be met



## Solar Hot Water/Drainback System





Drainback System



Differential Control



Collector for Drainback System  
Landscape Mount



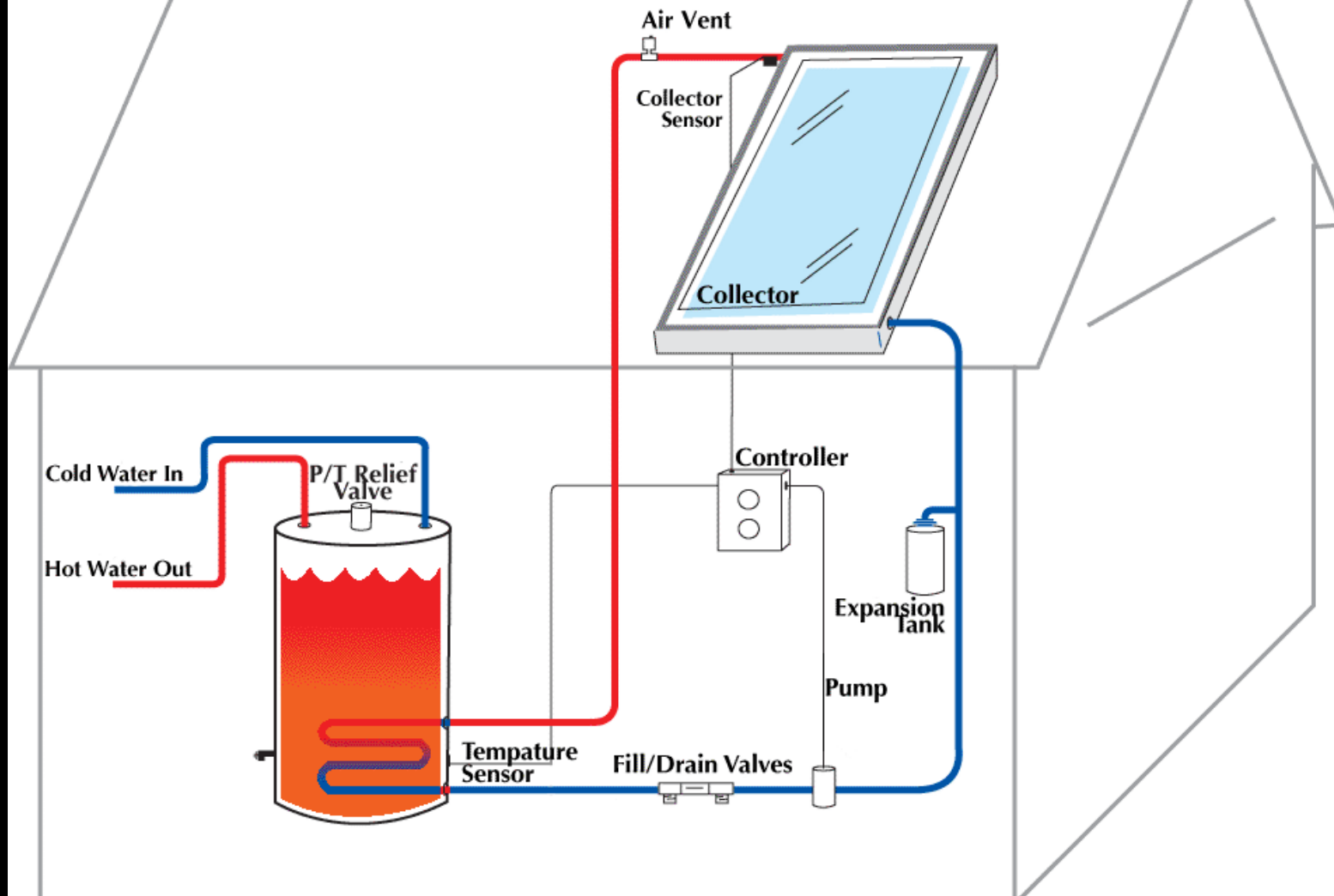
Collector for Drainback System  
Portrait Mount



Collector for Drainback System  
Landscape Mount



# Solar Hot Water/Glycol System





## Glycol Solar Hot Water System



Collector for Glycol System  
Flush Mounted



Collector for Glycol System  
Landscape Mount

# Rebates and Incentives

Incentives cover up to 70% of total cost:

- TEP rebate: up to \$1750
- Federal Tax Credit: 30% (of net cost)
- State Tax Credit: \$1,000
- City of Tucson: \$1000 permit fee waiver
- City or State sales tax: zero
- Property Tax increase: zero

*Example to follow...*

# Solar Hot Water System

\$5,900 Total Cost

- \$1,456 Utility Rebate

**\$4,444 Initial Outlay**

-\$1,333 Federal Tax Credit

-\$1,000 State Tax Credit

**\$2,111 Net System Cost**

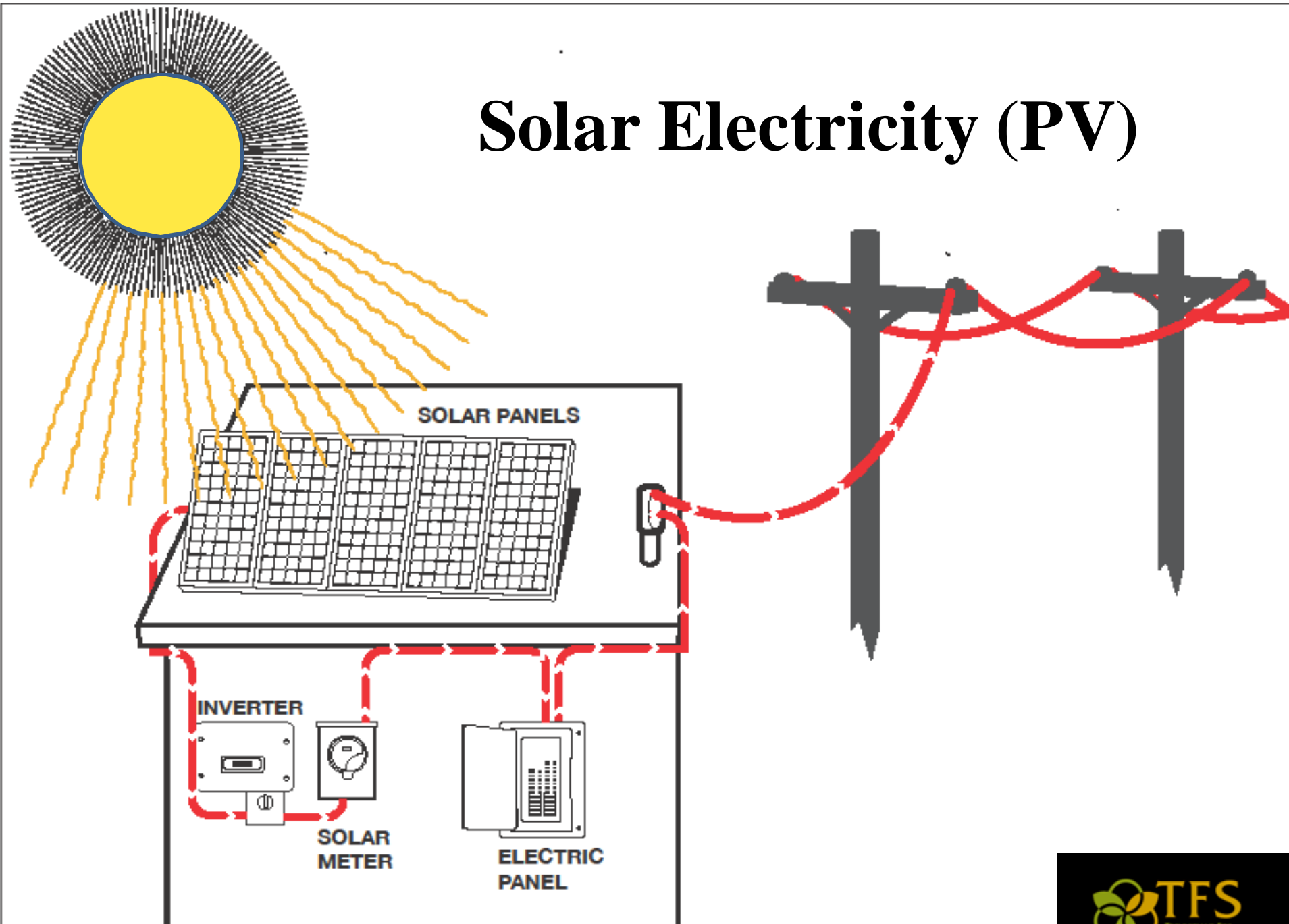
**Monthly Savings: ~\$20**

**Yearly Savings: ~\$240**

**Simple Payback: 8.7 yrs**

**Yearly Return on Investment: 11%**

# Solar Electricity (PV)



# What is Solar Electricity (aka: PV)?

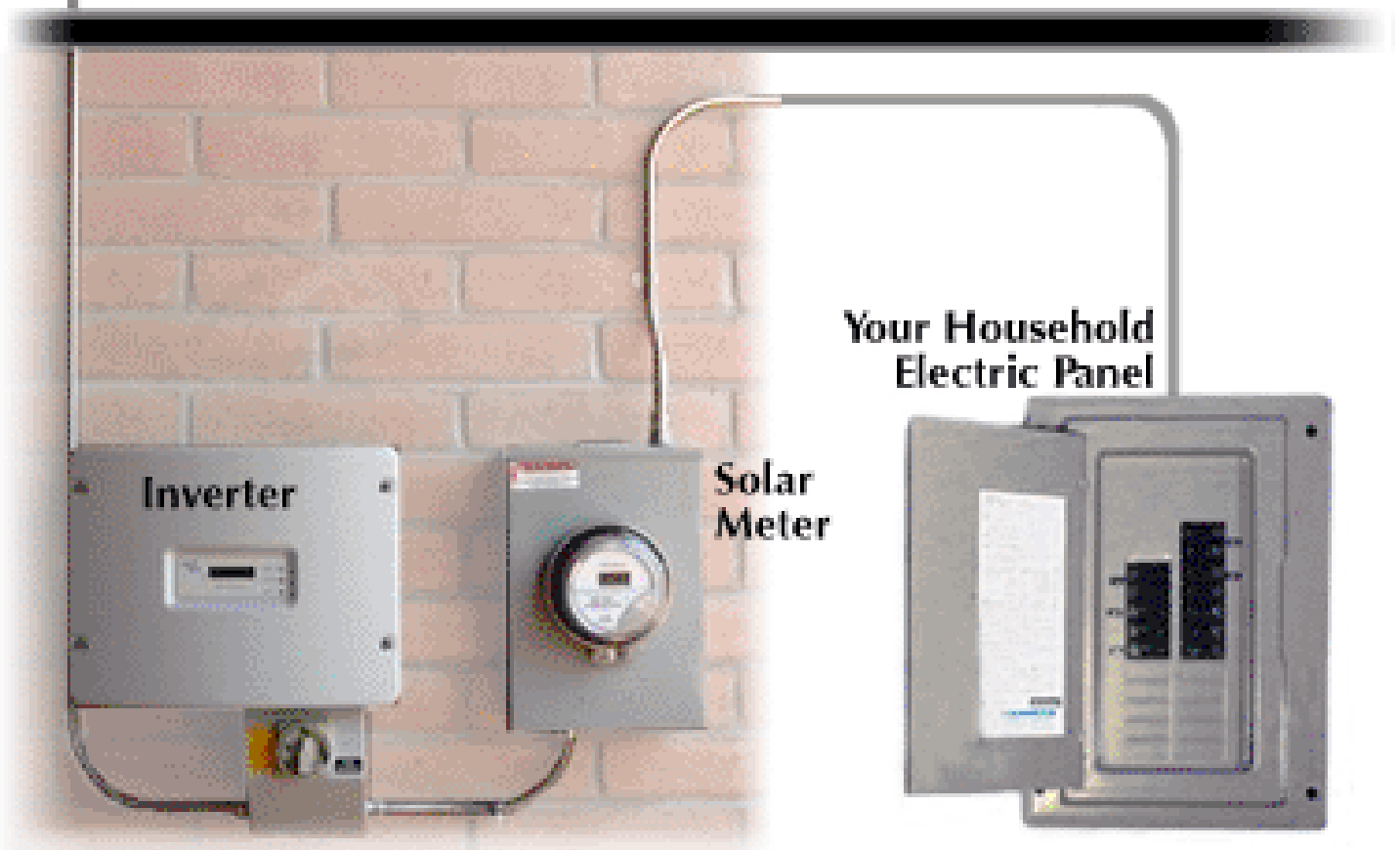
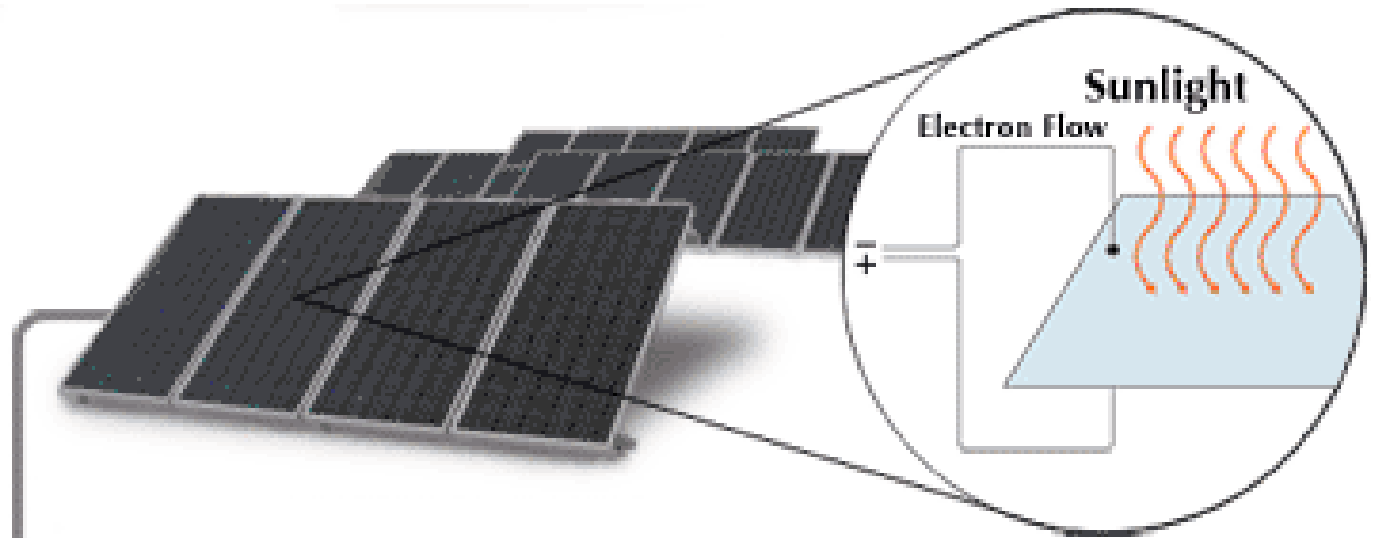
- Grid Tied Solar Electricity System:
  - Your home is a mini power plant
  - Connected to the utility grid
  - No batteries required
  - Protected from utility rate increases
  - Net Metering
  - No moving parts = low maintenance
  - System warranty

**1.** Solar Panels convert sunlight to DC power

**2.** This power is sent to the inverter, which converts DC to AC power

**3.** AC power goes from inverter to the service panel, for household use

**4.** Excess power flow into the utility grid & the utility gives you a credit







All Black  
Modules











Ground Mounted System



Dual Access Tracker



## Solar Pool Ramada

# What Size System Do I Need?



A UniSource Energy Company

Account: 123456789  
 Bill Date: 09-16-2009  
 Customer Name: TFS Customer  
 Service Address: 1234 Sustainable Lane,  
 Tucson, AZ 85719

PAGE: 1

Previous Balance	- Payments/Credits	+ Charges/Debits	= Current Balance
109.55	109.55	100.27	100.27

DUE DATE	AMOUNT DUE
09-28-2009	\$100.27

Payment: \$109.55 on 09/01/2009 - Thank you!

R-01 - Residential (Service No: 123456789)

Electric Charges for Period 08-14-09 - 09-15-09

## DELIVERY SERVICES

Customer Charge	7.00
Summer - 1st 500 kWh @ \$0.046925	23.46
Summer - Next 3000 kWh @ \$0.06896	24.83

## POWER SUPPLY CHARGES

Summer - kWh @ \$0.033198	28.55
PPFAC - kWh @ \$0.00	

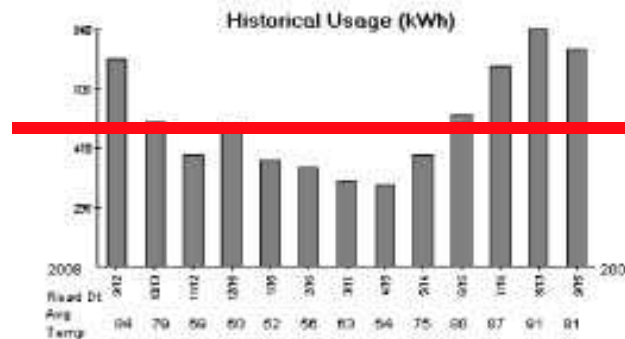
## GREEN ENERGY CHARGES

Renewable Energy Standard Tariff	4.50
DSM Surcharge - kWh @ \$0.000831	0.71

## TAXES AND ASSESSMENTS

AZISA Assessment	0.01
ACC Assessment	0.16
RUCO Assessment	0.04
City Franchise Fee	2.00
State Sales Tax	5.20
County Sales Tax	0.47
City Sales Tax	1.78
City Public Utility Tax	1.56

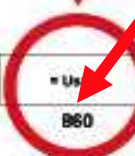
Total Electric Service Charges 100.27



Find Your  
Average  
Monthly  
Use

Monthly  
Energy  
Use

Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Use
XH-123456	kWh	10-14	9-15	8-13	33	8154	8068	86	10	860



# What Size System Do I Need?

**Formula:** average use/140-160 = system size

**Step 1:** Find you average monthly kWh usage.

- Add up each month's kWh usage & divide by 12

**Step 2:** Divide you average usage by 140 - 160

**Example:**

- Average monthly use = 623.5
- $623 / 145 = 4.3$
- 4.3 kW system size for this homeowner

# Rebates and Incentives

- TEP rebate: \$3 per watt (under 27kw)
- Federal Tax Credit: 30% (of net cost)
- State Tax Credit: \$1,000
- City of Tucson: \$1000 permit fee waiver
- City or State sales tax: zero
- Property Tax increase: zero
- Annual Return on Investment (ROI) = 8-10%

*Example to follow...*

# 4.3 kW System Costs

\$23,650 Total Cost  
- \$12,900 Utility Rebate  
**\$10,750 Initial Outlay**  
  
-\$3,225 Federal Tax Credit  
-\$1,000 State Tax Credit  
**\$6,525 Net System Cost**

Monthly Production: ~ 624 kWh

**Incentives cover 70% of total cost**

**Monthly Savings: ~\$60**

**Yearly Savings: ~\$720**

**Simple payback: 9 yrs**

**11.5% Yearly Return on Investment**

# Finance Opportunities

- Cash Purchase
- Refinance
- Lease/Power Purchase Agreement coming

## Mortgage Calculator

Mo

Mortgage amount: \$ 8030

Mortgage term: 15.000 years

Interest rate: 6 % per

Mortgage start date: Jan 19 2010

Monthly Payments: \$ 67.76

## Mortgage Calculator

Mo

Mortgage amount: \$ 8030

Mortgage term: 30.000 years

Interest rate: 6 % per

Mortgage start date: Jan 19 2010

Monthly Payments: \$ 48.14



Thank You!

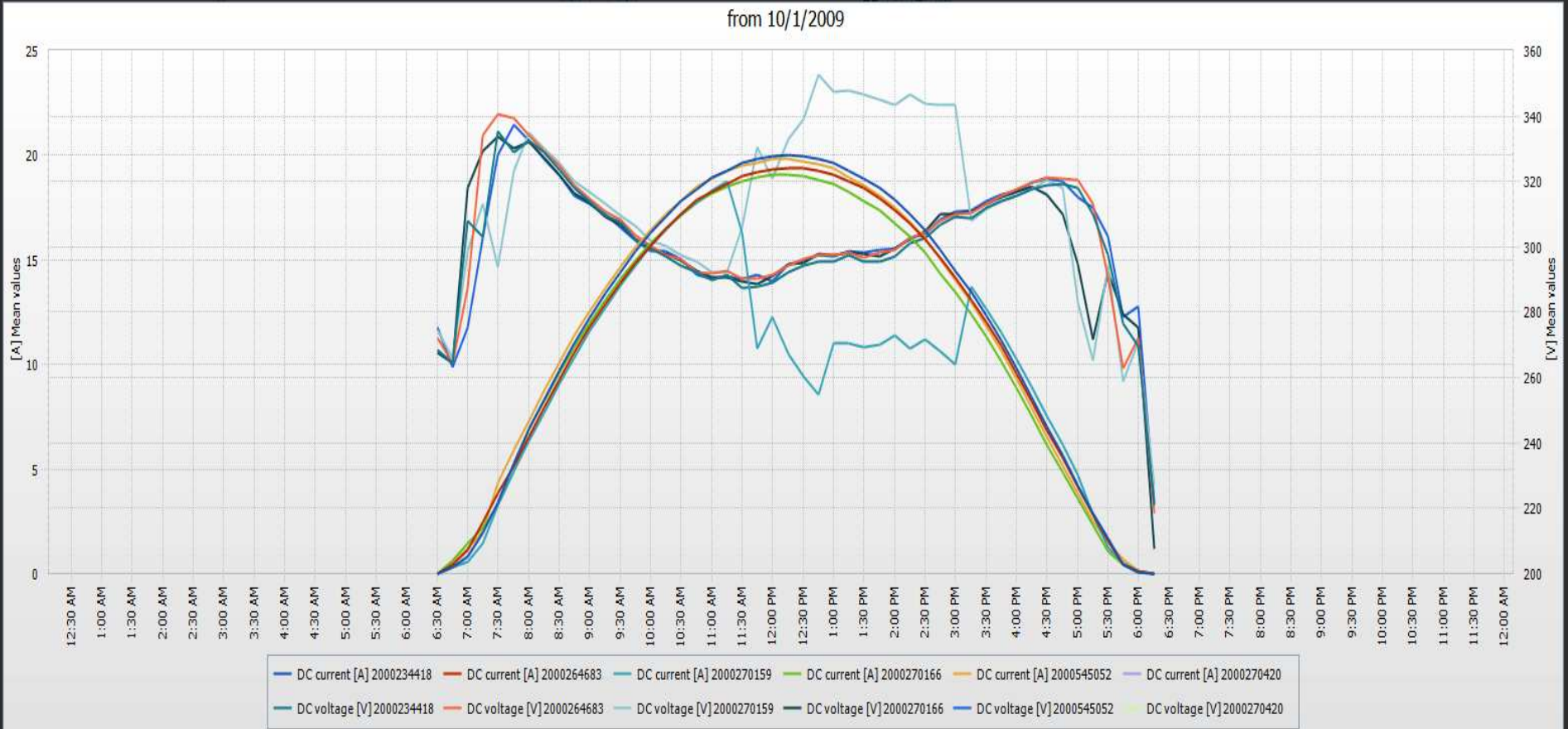
Questions?

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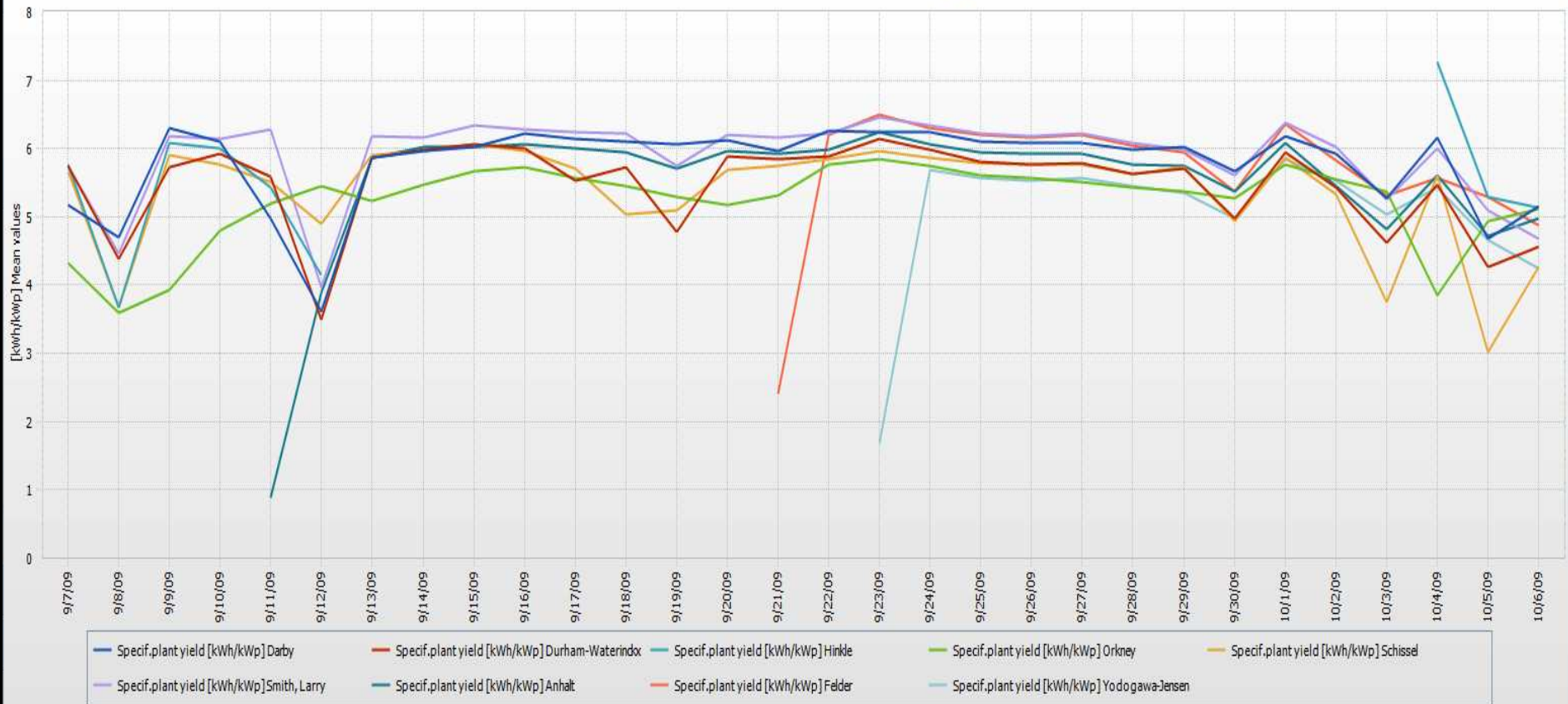
# Sunny Portal Data Monitoring

## Graph: Current & Voltage *Inverter Error*



# Sunny Portal Data Monitoring: Residential Standardized Yield

Residential comparison from 9/7/2009 to 10/6/2009





## TFS installations do not look like this

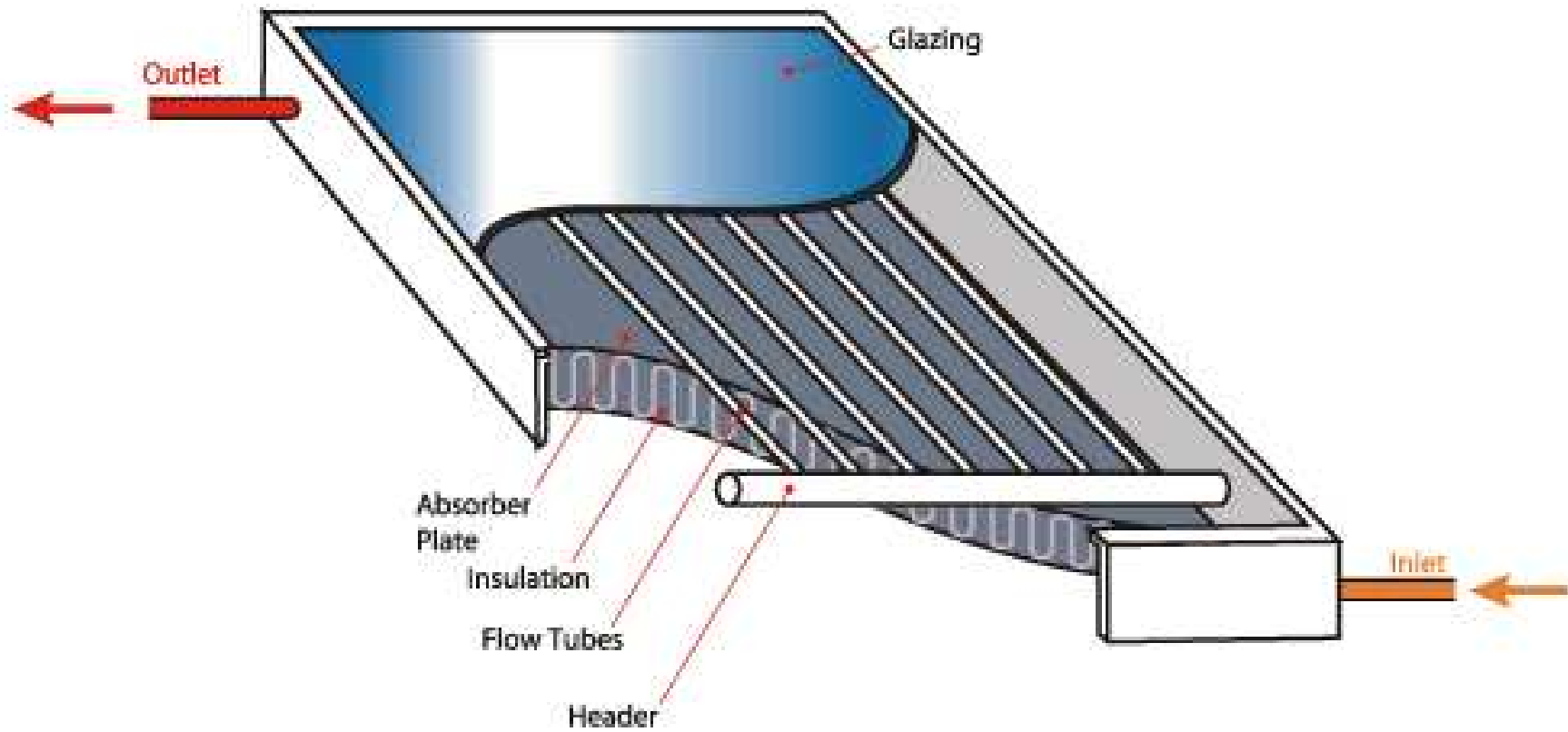
**\*\* To prevent this from happening to your system \*\***

- TFS raises conduit runs above the roof to prevent debris accumulation
- All roof penetrations use flashed standoffs for a lasting, water-tight seal
- Pipe insulation





## Flat Plate Collector



Source: [www.southface.org](http://www.southface.org)



